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ABSTRACT

The move from traditional paper-based distance education subject materials to those of information and communication technologies (ICT) has increased the ways in which students can engage with their lecturers, peers and the unit materials. In this paper, strategies for enhancing print-based learning resources are discussed. These include concept mapping by which the conceptual structure of a unit can be articulated, and online communication that can enhance the interactions between students and teachers. A review of student responses to concept mapping indicates a general acceptance of the tool, with comparisons of assessment grades between successive years of students suggesting an improvement for students who were exposed to concept mapping in conjunction with online communication. The study highlights several curriculum issues that need further work. (Contains 21 references, 2 tables, and 2 figures.) (Author)

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Making the Transition From Print: Integrating Concept Mapping and Online Communication With Traditional Distance Education Materials

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Abstract: The move from traditional paper-based distance education subject materials to the use of information and communication technologies (ICT) has increased the ways in which students can engage with their lecturers, peers and the unit materials. In this paper, strategies for enhancing print-based learning resources are discussed. These include concept mapping by which the conceptual structure of a unit can be articulated, and online communication that can enhance the interactions between students and teachers. A review of student responses to concept mapping indicates a general acceptance of the tool, with comparisons of assessment grades between successive years of students suggesting an improvement for students who were exposed to concept mapping in conjunction with online communication. The study highlighted several curriculum issues that need further work.

The Context

> *The problem faced by any university ... is how to structure itself so that its central academic activity is facilitated, not undermined, by technological developments* (Laurillard & Margetson, 1997, p. 4).

Monash University is a large institution with campuses or affiliates in Australia, Malaysia, South Africa, Italy and the United Kingdom. The use of ICT is increasing at Monash because of changes in higher education attributed (but not limited) to, funding, diverse student backgrounds (Australian Vice Chancellors' Committee, 1996), changing student expectations and lifestyles, new developments in technology, and opportunities for improved approaches to learning and teaching.

In 1994, Monash University was asked to provide coursework for the Australian Department of Foreign Affairs and Trade (DFAT) in Canberra. At that time, students were either existing or newly appointed officers of DFAT, as well as diplomats from developing countries throughout Africa, Asia and the South Pacific. As a consequence of this endeavour, the Monash University Diplomacy and Trade Program began. The program is run by the Department of Management in the Faculty of Business and Economics of Monash University and is designed specifically for aspiring, trainee or existing diplomats. Successful completion of the course results in the conferring of a Graduate Diploma or Master degree.

For the cohort under review in this paper, students generally range in age from 24 to 40 years of age. Approximately half are Australian, with the other half being international students. In almost all cases, academic backgrounds and vocational experiences are dominated by socio-political training. As a consequence, there is a minimal understanding of the more numerate sciences, of which economics is one. At the time of the review, the numbers in each off-campus class are small (approximately six), though there are approximately 40 students in each concurrent on-campus class. Thus, this unit is economically viable, especially as the fees are high.

Given the importance of economics in a global trade context, the two economics units, Principles of Microeconomics and Macroeconomics, as well as the Economics of Trade and Investment, are core compulsory subjects. This paper discusses the learning design of the unit, Principles of Microeconomics and Microeconomics. The unit incorporates all of the key issues raised in a full first year course of undergraduate

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economics, with the added emphasis of trade protection and microeconomic reform (Reiman, 1999). The challenge is to teach these fundamentals in one semester so that students are conversant with the policy-orientated approach of their next unit, Economics of Trade and Investment. A second challenge involved the physical location of the off-campus students where there are issues of access to the proposed online environment (for example, one student travelled very frequently and logged into the online discussions from a variety of countries during the course of the semester).

The team who developed the unit materials reached consensus on a view of learning based upon constructivist principles, in which knowledge is constructed individually and socially co-constructed by learners based on their interactions and experiences with the world (Biggs, 1999; Jonassen & Rohrer-Murphy, 1999; Kennedy & McNaught, 1997a). Integrating computer-mediated communication (CMC) to support a more student-centred learning environment was a key component of the design of the unit materials. The incorporation of online discussion groups has been shown to foster collaborative learning (Agostino, Lefoe, & Hedberg, 1997), improve flexibility in teaching and learning (Freeman, 1997), and support problem-based learning (Oliver & Omari, 1999).

In the past, the study materials for the off-campus cohort were entirely print-based. These materials were redeveloped to be used in conjunction with concept maps, and a number of online discussion groups. The on-campus students had a traditional set of lectures and tutorials; the concepts maps were given to the students and used by the lecturer during classes.

The Concept Maps and Online Discussion Groups

Concept mapping has a history of extensive use for improving student learning and metacognition. It has been used in domains as diverse as chemistry (Cullen, 1990; Ross & Munby, 1990); biology (Jegede, Alaiyemola, & Okebukola, 1990); physics (Pankratius, 1990); microbiology (Barenholz & Tamir, 1992); hypermedia development (Kennedy, 1995; Kennedy & Taylor, 1994), and the design of computer-based learning tools (Kennedy & McNaught, 1997b).

The concept maps were developed using software called *Inspiration* (Helfgott, Shankland, Stafford, & Samson, 1997). In Figure 1, the master concept map is shown. Very positive feedback was received from a number of students on its usefulness (discussed later). The master concept map was further broken down into sections that addressed a single week. In Figure 2, the concepts in italics are from pass and future weeks, while the concepts related to week 11 are in normal style print.

Online discussion groups were linked to the content of the print-based materials. Five discussion groups were created. These were announcements (read-only by students), general discussion (for ongoing discussions during the semester), and three groups associated with specific assessment tasks. The three online assessable discussion groups were designed to:

- help the students' written communication skills;
- develop their ability to structure an economic argument;
- develop their understanding of economic concepts;
- allow students to share ideas with peers, wherever they may be; and
- develop online collaborative skills.

Students' marks for these discussion groups contributed only 15% to the final grade. The overall assessment strategies were not markedly changed and were similar for both off-campus and on-campus groups.

Development Issues for the Unit

In the frequently perceived headlong rush to put all course content online, academics and students are expected to engage with new ways of thinking and working, while simultaneously developing new skills. In the transition between more traditional approaches to curriculum development and design, older technologies are often disregarded as being irrelevant and outmoded. The second author of this paper was an experienced lecturer in

face-to-face situations, but new to the use of concept maps as a holistic organisational learning tool, and the use and management of asynchronous online discussion groups.

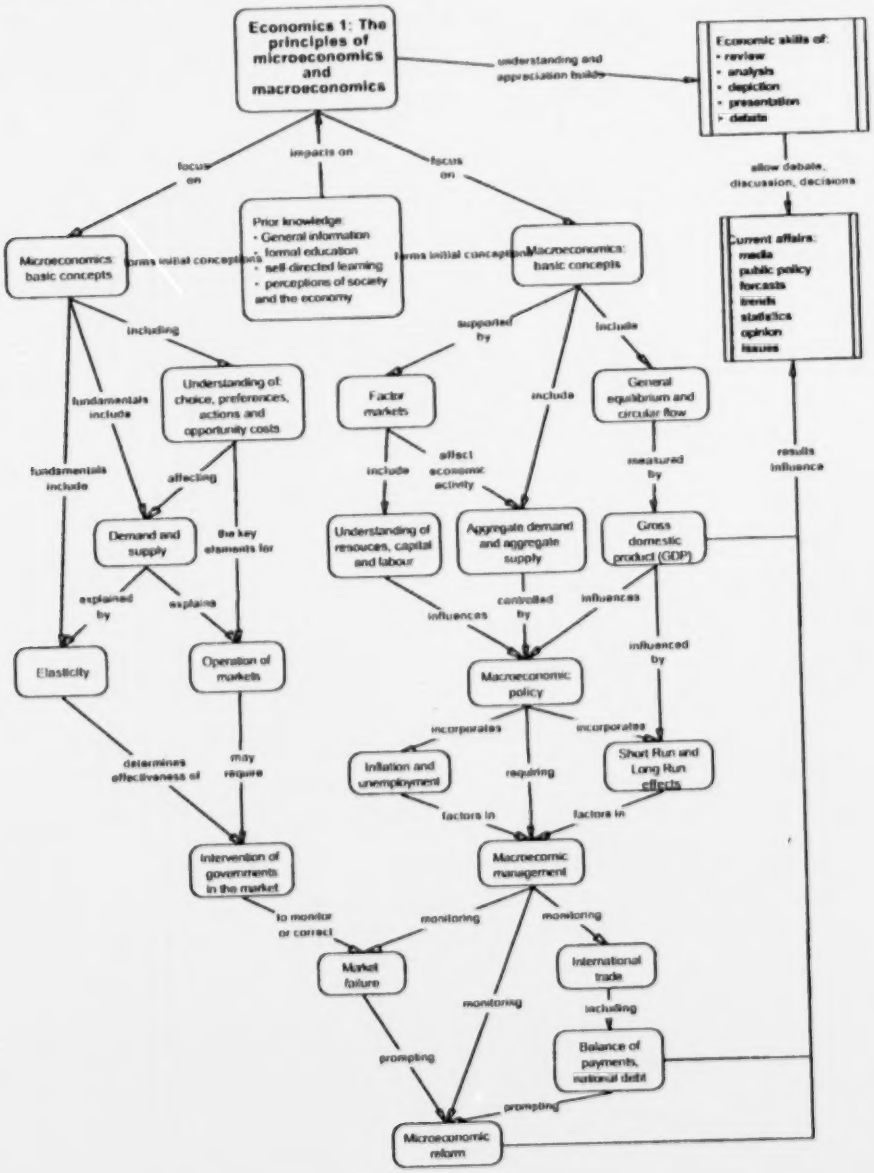

Figure 1: The major concept map for the course

The development of these unit materials represented a departure from his previous experience. The first author is an educational designer, experienced in the use of both learning tools. The development of the unit materials involved building effective electronic communication methods (fax, email and telephone) between the two

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authors, as author one was based in Melbourne, while author two was in Canberra, a one-hour air flight away. The development of the concept maps, in particular, required extensive use of the fax, particularly as hand written comments on the drafts of Figure 1 were crucial to the final outcome.

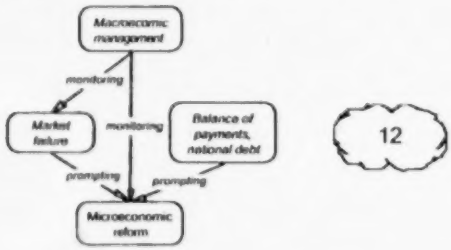

Figure 2: The individual concept map for Week 12.

The development of the online communication groups was less problematic, as Monash University had recently developed a web-based virtual doorway (the MyMonash Portal) to support students' administrative and educational needs (Kennedy, Webster, Benson, James, & Bailey, In press). Issues of managing the online discussion groups were addressed in the development of the print-based materials, with particular focus on the assessment linked to the participation in three of the discussion groups, and access to appropriate readings (Berge, 1995; Mason, 1997; Salmon, 2000).

Evaluation of students' perceptions of the concept maps

This small study was with a class taught in 1999, with the evaluation data being collected early in 2000 after the completion of the unit. A questionnaire that focused on the integration of the concept maps in the written materials was given to both the off-campus and on-campus students. The responses to selected questions are shown below in Table 1. None of the students had any prior experience with concept mapping. There were three off-campus students and all replied; there were 48 on-campus students, but only eleven students responded to the questionnaire. As with all groups of students, there are differing levels of interest in the unit matter, and diversity of learning styles, such as whether students were 'visual' in their cognitive approaches. Few of the on-campus students used the concept maps; they cited the complexity of the maps and their lack of time for the reasons. The off-campus students appeared to use the maps more but these questionnaire results suggest that they found the concept maps more useful with revision rather than as a primary learning tool.

Q1: Did you find that the major concept map was informative? Please explain your answer.	
Off-campus	On-campus
• The Concept Map was useful for seeing how all of the sectors of the course interrelated. It was informative although I didn't use it or retain the information in it when I was enquiring what was up next. • It was to some extent as it visualised the big picture of economics and where each concept fitted in. However, I only ever used it for reference between topics to see how things interacted.	• Yes. It briefly explains the basic concepts and guides us as to the differences (and similarities) between macroeconomic and microeconomics throughout the semester. • By the end of the course I found it useful to assist in reviewing the topics studied and to connect them together in context. • It was useful to look at once or twice, but I have to admit I didn't really use it. • No – hard to follow and confusing. • I found it useful to review prior to tests, in terms of 'putting it all together'.
Q2: Do you believe that the major concept map assisted you in your overall process of learning in this unit?	
Off-campus	On-campus
• Yes, but not until later, when I had the earlier ideas in my mind • It was a good diagrammatical representation of the course's concepts, and helped me to know where my knowledge was lacking, or where I needed to review my understanding	• Helped with an overview of the topics when reviewing, and to understand how they connected. • Didn't use it. • When I first started economics, I was confused because I had to learn so many things in a short time. The concept map guided me in finding the right approach to economics. • There was too much to learn within a short space of time.

Q3: Did you attempt to construct, as the study guide suggested, your own concept maps of your understanding of economics?	
Off-campus	On-campus
• Because I tend not to be a very visual person, they do little to expand my learning or understanding of a topic. Lots of other people might benefit greatly from them though • Had no time and the existing concept maps were good enough for revision etc.	• Maybe not as detailed as the attached concept map, but it helps simplify relationships. • Didn't occur to me! • It doesn't help me. • No time. • It never occurred to me. I would probably do it in the future given time. • Yes, specific issues only: not 'the big picture'. • Since we had little time for Economics 1, to understand and learn economics in a systematic way is very crucial. Your map helped me a great deal in understanding the subject. • Yes, for microeconomics test.

Table 1: Sample questionnaire responses for both groups of 1999 students

It may be that the lack of familiarity and their inability (mainlya lack of time) to develop their own concept maps were problematic. The development team has learnt that an innovation in learning design, such as the use of concept maps, must be carefully budgeted for in terms of students' time.Students may appreciate these maps, but the time to become familiar with them, and to explore their potential, must be allocated carefully. The question of whether, to what degree, and how innovations such as concept mapping and online discussion groups should be assessed has not been resolved; assessment is likely to become one of the main curriculum issues in the next few years. The use of the discussion groups was not evaluated by specific questionnaires, or requests for specific feedback. However, all online assessment tasks were completed extremely well, with students able to articulate a deep understanding of specific concepts.

Unit Learning Outcomes

With concept mapping and online discussions providing a focussed approach to the learning of economics, it may be anticipated that students might learn more about the unit. This added learning may result in higher marks. These results should be seen as anecdotal rather than definitive, if only due to the small sample size. In this regard, it should be noted that the nature and content of the course work in the two economics units taught in the Diplomacy and Trade program remained relatively unchanged over a two-year period under review in this paper. Specifically, assessment details were available for the year prior to the introduction of concept mapping in Economics 1, as well as in the year during which Economics 1 concept mapping was provided as an additional educational tool. As noted earlier, the major assignments for the two groups, off-campus and on-campus, were similar. Note also that the lecturer was the same for all cohorts.As a consequence, a comparison was made between assessment scores gained bystudents who had been exposed to concept mapping and online discussion, as well as scores gained by students who had not seen either. As can be seen in Table 2, scores for individual tests, and the total, were higher, on average, for the innovation cohort. An overall advantage of 16.1 per cent is noted between successive years.

Assessment	Pre-concept mapping	Post concept mapping	Change (%)
First test	62.6	76.4	22.0
Second test	60.6	66.1	9.1
Third test	65.3	82.9	26.9
Overall result	64.2	74.6	16.1

Table 2: Sequential first semester results: Before and after concept mapping

Conclusions and Summary

The design and development of the unit materials involved the establishment of trust, understanding and good communication between the content expert and the educational designer. The current structure of the unit is being used by the Faculty of Business Economics as an example for other academics who wish to start the transition from more traditional distance education materials to more engaging, interactive ways of developing

student knowledge. The book (paper-based unit guide) still has its place, but integration of online communication enables students, who are often isolated from their colleagues, to engage with their peers, receive feedback from the lecturer and complete assessment tasks that are more relevant to the desired learning outcomes. Whilst there are potential confounding factors at work when making absolute comparisons between two groups of students across years, the anecdotal inference is that there is a benefit to students who have been exposed to an holistic view of the unit by the use of concept mapping as an advance organiser and revision tool, and had the opportunity to engage in asynchronous online discussions.

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